UTAH HERPETOLOGISTS LEAGUE JOURNAL

MARCH 1975 VOLUME 2, NUMBER 1

Vol. 2 No. 1 March 1975

UTAH HERPETOLOGISTS LEAGUE

OFFICERS

PRESIDENT - James L. Glenn
Venom Research Laboratory
Veterans Administration Hospital
and Hogle Zoological Gardens
Salt Lake City, Utah 84113

VICE PRESIDENT - Earl A. Jenne
Department of Zoology
Weber State College
Ogden, Utah 84403

SEC-TREASURER - Michael P. Coffeen
Reptile Department
Hogle Zoological Gardens
Salt Lake City, Utah 84113

COMMITTEES

MEMBERSHIP - Michael P. Coffeen
Elizabeth Choules
Earl Jenne
Robert Larsen
Bert Marks
Barbara Mendez

NEWSLETTER - James L. Glenn
Michael P. Coffeen
Earl Jenne
Janice Matz
Barbara Mendez
Leonard Wojcik

JOURNAL

EDITORIAL STAFF - A. Lamar Farnsworth
James L. Glenn
Earl A. Jenne
Richard C. Straight

ART EDITOR - Kerry S. Matz

TYPIST - Kathryn D. Webb

A non profit organization

UTAH HERPETOLOGISTS LEAGUE JOURNAL

VOLUME 2 NUMBER 1 March 1975

This organization was formed in January of 1974 and incorporated within the state of Utah under the title Utah Herpetologists League, a subsidiary of the Utah Zoological Society. The League is open to all individuals for membership, professional and non-professional alike. The objectives of this organization are as follows:

1. *To work towards conservation of Utah's species of reptiles and amphibians (protection where needed) and State Laws regulating their export and control.*

2. *To educate those interested concerning reptiles and amphibians so a better understanding will increase appreciation of these valuable animals.*

3. *To encourage field studies and laboratory research involving the Utah fauna, encompassing environment, geographical distribution, population dynamics, biologics, etc.....*

4. *To circulate data, photos, experiences, research and other information to the major zoos of this country and other interested institutions.*

Monthly meetings are held on the first Thursday at 7:30 p.m. Meeting location is the Utah Wildlife Resources Building, 1596 West No. Temple, Salt Lake City, Utah. Membership fees are as follows:

Regular Membership:	*5.00/year*
Contributing Member:	*10.00+/year*

Members receive the Newsletter and the League Journal and the right to attend all league meetings and participate therein.

Vol. 2 No. 1 March 1975

CONTENTS

Page

1 Technique for Testing Antibiotic Plasma Levels in *Ophidia*..... *Richard G. Moulton, James L. Glenn, Richard C. Straight and Michael P. Coffeen*

5 Reptiles in the Bible - part II.....*Phillip M. Leonard and James L. Glenn*

13 Book Reviews.....Editor

15 Amphibian and Reptilian Reproduction Section

15 *Crotalidae*.....*James L. Glenn, Richard C. Straight and Clifford C. Snyder*

20 *Colubridae*.....*Michael P. Coffeen*

26 Notice to Institutions

Front Cover Art - *K. S. Matz*

Page 12 - *K. S. Matz*, Turtle Skull (*Staurotypus salvinii*) lateral and ventral view

Page 14 - *K. S. Matz*, Head of Eastern Indigo Snake (*Drymarchon corais couperi*)

Photo - Back Cover - Venom Research Laboratory Serpentarium and 13 foot King Cobra (*Ophiophagus hannah*)

COPYRIGHT 1975 - Rights reserved by the UTAH HERPETOLOGISTS LEAGUE

TECHNIQUE FOR TESTING ANTIBIOTIC PLASMA LEVELS IN *OPHIDIA*

*Richard G. Moulton**, *James L. Glenn, Richard C. Straight and Michael Coffeen*
Venom Research Laboratory
Veterans Administration Hospital
and
Hogle Zoological Gardens
Salt Lake City, Utah 84113

The use of antibiotics for treatment of reptilian microbial infections is a general practice today. The great value of antimicrobial agents is not to be denied. However, the indiscriminate and oftentimes casual use of these drugs can provoke a variety of untoward effects (2). One major problem is to achieve and maintain sufficient plasma levels so the antibiotic can exert its bacteriostatic or bactericidal effect, and not "overdose" or "underdose" the reptile. The present method of determining dosage for reptiles is using the dosage per weight prescribed for man or other mammals. Although satisfactory results are often achieved with mammalian dose regimens, the need for reptilian dosage information is apparent. This study was initiated to provide preliminary information on the efficacy of the method of Anderson (1), in determining quantatively the longevity of antibiotics in ophidian plasma. The resulting plasma levels are compared to published human plasma levels.

Test Species

Due to the large size and availability, the eastern diamondback rattlesnake (*Crotalus adamanteus*) was used in the experiment. The specimens were housed in the Venom Research Laboratory Serpentarium, VA Hospital. Temp° was monitored constantly on a recording thermometer.

Antibiotic Injection and Dosage

Ampicillin was diluted in normal saline to a concentration of 10 milligrams per milliter. The dosage used was that recommended for human use, 500 mg/72 kg or approximately 7 mg/kg (2). The route of injection was intramuscular.

Plasma Collection

Following the antibiotic injection, the plasma was collected by cardiac puncture at 30 min., 1 hr, 2 hr, 3 hr, 6 hr, 13 hr and 21 hr intervals. The procedure was as follows and requires an assistant.

The snake is pinned and securely grasped behind the head. The assistant grasps the body to restrain the snake in a straight line with ventral side up. The heart is located approximately one third the length of the snake from the head. The assistant's thumb and forefinger are positioned

*Presently located at the Microbiology Dept., College of Med., Univ. of Pittsburgh, Pittsburgh, Pa. 15261

on each side of the heart (lengthwise) and finger pressure is used to contain the heart and keep it immobile. The needle (20-22 gauge in large snakes) is inserted at a 45-60° angle, through the ventral scale into the body cavity until the heart action can be visualized or felt against the needle. The puncture is achieved with short quick motion. Following sera collection the needle is withdrawn with as little lateral movement as possible to prevent any tearing of cardiac tissue.

Blood (3 ml) was collected in heparinized tubes (450 units/3 ml sera). The blood was centrifuged to remove cells and the supernatant plasma was frozen until assayed (within 24 hr.).

Bacterial Inoculum (1)

Staphylococcus aureus was grown overnight on a nutrient agar plate at 37° C. Several colonies were picked and inoculated into 10.0 ml of brain-heart infusion broth. The broth was incubated overnight at 37° C. The final inoculum was a 1:1000 dilution of the broth culture.

Titration of the Antibiotic Solution and Plasma Samples (1)

Antibiotic control - Ampicillin* was made to a concentration of 10 µg/ml in normal snake (*C. adamanteus*) plasma. To all but the first tube in a series of 12 tubes, 0.5 ml of brain-heart infusion broth was added. Tubes #1 and #2 received 0.5 ml of the control antibiotic solution (10 µg/ml). Two fold dilutions were made in tubes #2-11, leaving 0.5 ml in each tube. No antibiotic was added to tube #12 (control bacterial growth). All tubes except #11 received 1.5 ml of *S. aureus* inoculum.

Test Serum (1) - The procedure was duplicated, substituting the snake plasma to be tested in place of the control antibiotic solution. An antibiotic control sample was run with each snake plasma experiment. The tubes were incubated overnight at 37° C.

Brief Summary of Method (1)

1. Set up series of 12 sterile tubes (13 x 100 mm).
2. Tubes #2-12 add 0.5 ml sterile brain heart infusion broth.
3. Tubes #1,2-add 0.5 ml of ampicillin solution 10 µg/ml.
4. Mix contents of #2 and transfer 0.5 ml to tube #3. Make similar transfer through tube #11, using fresh sterile pipette each time.
5. Repeat steps 1-4 only use test plasma sample instead of control antibiotic solution.
6. Dilute 24 hr. culture of *Staphylococcus aureus* 1:1000 in brain heart infusion broth.
7. Add 1.5 ml of *S. aureus* broth to all tubes except #11 (used as control for sterile technique) in both series of 12 tubes.
8. Incubate tubes 37° C for 18-24 hrs.

*OMNIPEN-N (Sodium Ampicillin), Wyeth Lab, identical to the ampicillin injected into the snake.

Interpretation of Results

The last tube in the antibiotic dilution series to have no visible growth was considered to contain the minimal concentration of antibiotic required to inhibit growth of *S. aureus*. The last tube to contain no visible growth in the test plasma dilution series was assumed to contain the same concentration of antibiotic. For example if tube #5 of the antibiotic series was the final tube to exhibit no growth, the minimal concentration inhibiting growth would be in tube #5 with a concentration of .156 µg/ml (considering the dilution caused by all reagents). If tube #7 in the plasma dilution series is the last tube with no growth, the antibiotic concentration in that tube would also be .156 µg/ml. Counting backward six tubes (doubling the concentration of each tube) the antibiotic concentration in the plasma sample in tube #1 would be 10 µg/ml. The true antibiotic concentration in tube #1 must be multiplied by 4 to obtain the concentration in the undiluted plasma (each tube was further diluted 1:4 by addition of the *staph* inoculum). The undiluted snake plasma in this example would have contained 40 µg ampicillin per ml.

SUMMARY

The two rattlesnakes demonstrated different Ampicillin plasma levels. Both were considerably different from human plasma levels (graph). The snakes reached peak plasma levels of 20-40 µg/ml at 1 to 2 hours. Levels declined exponentially with time and still had activity after 13-15 hours. These figures are compared to human plasma levels that reach a peak of 7-10 µg/ml at approximately 1 hour and are only detectable in the plasma for six hours or slightly longer (2).

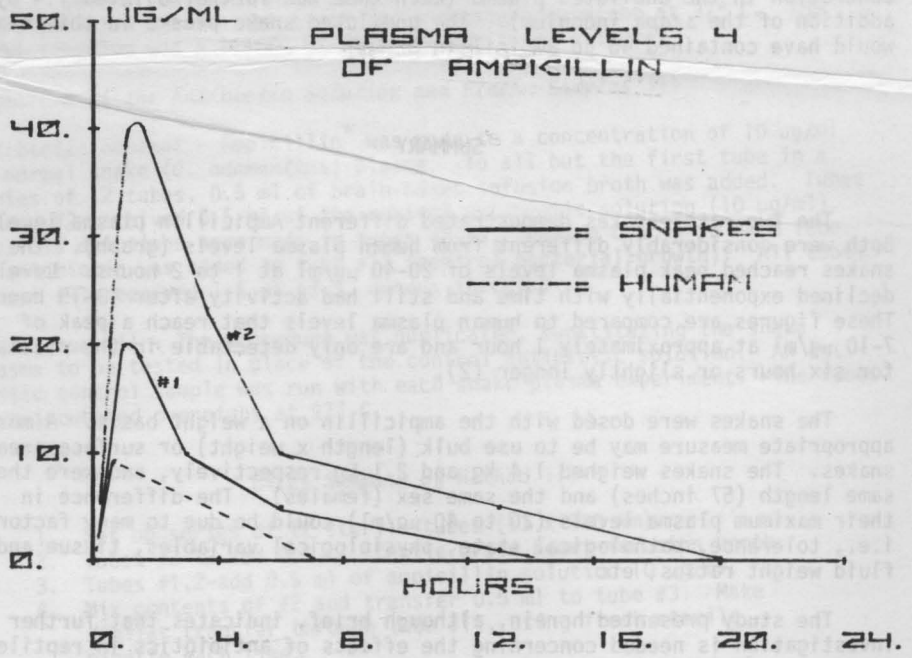
The snakes were dosed with the ampicillin on a weight basis. A more appropriate measure may be to use bulk (length x weight) or surface area in snakes. The snakes weighed 1.4 kg and 2.1 kg respectively, and were the same length (57 inches) and the same sex (females). The difference in their maximum plasma levels (20 to 40 µg/ml) could be due to many factors, i.e., tolerance, pathological state, physiological variables, tissue and fluid weight ratios, etc.

The study presented herein, although brief, indicates that further investigation is needed concerning the effects of antibiotics in reptiles. The two experiments indicated that C. adamanteus (78-80° F) possibly achieves peak plasma ampicillin levels 2 to 4 times human plasma levels (98.6° F). The snakes also maintained detectable bacteriocidal plasma levels approximately twice as long as humans when injected with the recommended dose of 7 mg/kg. The 13 hour longevity of ampicillin (when administered 7 mg/kg) in the snakes plasma is achieved with the first injection. Future investigations should include testing efficacy of subsequent injections and for any accumulative effect, although penicillins are not known to be accumulative. Temperature must also be considered in any reptilian experiments.

REFERENCES

1. Anderson, T.G., *Testing of Susceptibility to Antimicrobial Agents and Assay of Antimicrobial Agents in Body Fluids*. Manual of Clinical Microbiology, p. 299-310, 1970.

2. Goodman, L.S. and Gilman, A., ((Editors) *The Pharmacological Basis of Therapeutics*, 2nd edition, p. 1223 and 3rd edition, p. 1171-1307, 1966.



Snake #1 = Weight = 1.4 Kg, Dose = 9.8 mg
Snake #2 = Weight = 2.1 Kg, Dose = 14.7 mg
Human = Weight = 72 Kg, Dose = 500 mg (2)

REPTILES IN THE BIBLE - Part II

Phillip M. Leonard and James L. Glenn
Veterans Administration Hospital
Salt Lake City, Utah 84113

This is the second report in this series concerning the occurrence of reptiles in the *Holy Bible* (7). The first report (4) cited the Hebrew and Greek nomenclature for reptiles and listed all verses containing the direct reptilian citations in both the *Old Testament* and *New Testament*. We endeavor now to explore the role of reptiles in the Bible. It is not our intention to interpret, but to recount the fundamental knowledge contained in the Bible regarding reptiles and their seemingly mysterious ways.

Because of problems in the translation of certain passages in the Bible, certainty of meaning can only be obtained by examination of the original Hebrew language for the *Old Testament* and the Greek language for the *New Testament*. It is for this reason the authors have included in this report several key Hebrew and Greek words in the passages with which we have dealt. It is our desire that this serve to develop lucidity of thought, and not confusion of the issues.

LOCOMOTION

Gen 3:14 upon thy belly shalt thou go,
Job 26:13 his hand hath formed the crooked (E) serpent.
Prov 30:19 the way of a serpent upon a rock;
Isa 27:1 piercing (E) serpent,....that crooked (A) serpent;

The agile movements of a legless form seemed to mystify some men of Biblical times. The tortous path taken by a snake traveling on its belly must have seemed to be a laborious task.* Locomotion is associated with fleeing, but not with aggression.

*(Author's note: The sidewinding mode of travel used by the desert vipers (*Cerastes* and *Aspis*) may best convey this idea to the reader.)

INGESTION OF FOOD

Gen 3:14 dust shalt thou eat
Isa 65:25 and dust shall be the serpent's meat.

Though references are sparse, the need for snakes to ingest food has apparently long been understood.

ORIGIN OF SPECIES

Gen 1:24,25 *Let the earth bring forth the living creature after his kind, cattle, and creeping thing ,....and God saw that it was good.*

Gen 8:17 *....and of every creeping thing....; that they may breed abundantly in the earth, and be fruitful, and multiply upon the earth.*

These passages state that God brought reptiles into existance as a part of the ecological system. The statements recognize the existance of reptiles as being good, and He declared that they should breed and have young, and increase in numbers.

ANATOMY - PHYSIOLOGY

Gen 3:14 *upon thy belly shalt thou go, and dust shalt thou eat all the days of thy life:*

Gen 49:17 *Dan shall be a serpent by the way, an adder* (see Utah Herp. League J. 1(1):1-8, 1974) *in the path,*

Ex 4:4 *and take it by the tail.*

Ex 7:12 *For they cast down every man his rod, and they became serpents: but Aaron's rod swallowed up their rods.*

Num 21:6 *the Lord sent fiery* (C) *serpents*

Deut 32:24 *with the poison of serpents of the dust.*

Deut 32:33 *the poison of dragons, and the cruel* (B) *venom of asps.*

Job 20:14 *the gall of asps*

Job 20:16 *He shall suck the poison of asps: the vipers tongue shall slay him.*

Psa 58:4 *Their poison is like the poison of a serpent: they are like the deaf adder...;*

Psa 140:3 *They have sharpened their tongues like a serpent; adders' poison is under their lips.*

Isa 59:5 *They hatch cockatrice' eggs,*

Rom 3:13 *the poison of asps is under their lips:*

From the preceeding list of references one can find a number of body parts that the Bible has attributed to reptiles i.e., belly, tongue, lips, tail, mouth and throat. The mention of snake bile and also the poison underlying the lips of snakes would indicate at least a limited knowledge of the internal anatomy.

It is of considerable interest to note that the writer of *Psalm 58* was aware of the lack of an auditory sense in snakes, and that *Moses* attributed the burning and violent effects resulting from snakebite to the venom and not to evil spirits or the like. Egg laying is mentioned, but viviparity is not.

The Bible records peoples' statements, but does not intend to lend divine agreement to the statement unless *God* is represented as having made such a statement Himself. Therefore *Job 20:16* (*the vipers tongue shall slay him*) represents *Zophar's* own misconception, and not the understanding of those who were purportedly instructed by *God*.

AUDITION - VOCALIZATION - CONCENTRATION

Psa	*58:4*	*they are like the deaf adder*
Ecl	*10:11*	*Surely the serpent will bite without enchantment:*
Mic	*1:8*	*I will make a wailing like the dragons,*

Apparently there has long been an understanding that snakes can not hear airborne sounds. Simple statements like *Mic 1:8* could be the vocalization of crocodiles or monitor lizards. *Ecl 10:11* gives us indirect evidence of man's early perception of many snakes ability to concentrate and thus have his attention diverted to man's advantage.

CRYPTIC NATURE

Ecl	*10:8*	*....and whoso breaketh an hedge, a serpent shall bite him.*
Isa	*11:8*	*And the sucking child shall play on the hole of the asp, and the weaned child shall put his hand on the cockatrice' den.*
Jer	*9:11*	*Jerusalem heaps and a den of dragons*
	51:37	*And Babylon shall become heaps, a dwellingplace for dragons,*
Am	*5:19*	*and leaned his hand on the wall, and a serpent bit him.*
Acts	*28:3*	*And when Paul had gathered a bundle of sticks, and laid them on the fire, there came a viper out of the heat,*

Various reptiles were known to be cryptic by nature, or were known to have dens, or some type of hole. Reptiles could be expected to inhabit a crevice in a wall, or a hedge, or pile of sticks. Piles of rubble from a destroyed village or town might become the new home of a lizard or snake.

SNAKEBITE

Num	*21:6*	*And the Lord sent fiery (C) serpents among the people, and they bit the people; and much people of Israel died.*

Deut 32:33 *Their wine is the poison of dragons, and the cruel (B) venom of asps.*

Psa 140:3 *....adders' poison is under their lips.*

Prov 23:32 *At the last it biteth like a serpent, and stingeth (F) like an adder.*

Acts 28:3,6 *And when Paul had gathered a bundle of sticks, and laid them on the fire, there came a viper out of the heat, and fastened on his hand.*
Howbeit they looked when he should have swollen (G) or fallen down dead suddenly: but after they had looked a great while, and saw no harm come to him, they changed their minds and said that he was a god.

Although there are at least six other passages mentioning snakebite these five probably are adequate to deal with the subject.

In general snakebite seems to have been understood as a traumatic incident during which a distinct wound was made by the snake. The victim experienced a violent burning sensation, swelling, and oftentimes death. These passages seem to indicate that the death was violent and resulted from the victim being envenomated from a bite. The venom originating from beneath the lips of the serpent.

HANDLING

Ex 4:4 *And the Lord said unto Moses, Put forth thine hand, and take it by the tail.*

Here we have a reference to handling a snake by means of 'tailing' that is about 3200 years old.

DESTROYING REPTILES

Psa 74:13 *thou brakest the heads of the dragons in the waters.*

Psa 91:13 *Thou shalt tread upon the lion and adder: the young lion and the dragon shalt thou trample under feet.*

Isa 51:9 *Art thou not it that hath cut Rahab, and wounded (I) the dragon?*

These passages indicate that reptiles were exterminated by trampling, cutting or piercing with something, or by some means of breaking the skull. (Author's Note: Modern man uses additional tools of destruction; guns, dynamite, pesticides, automobiles, pollution, habitat destruction, etc....)

HUMAN ETHOLOGY

Gen	*1:25,26*	*And God made....everything that creepeth upon the earth, after his kind: and God saw that it was good. And God said, Let us make man....and let them have dominion over....every creeping thing...*
Gen	*9:3*	*Every moving thing that liveth shall be meat for you;*
Ex	*4:3*	*...and it became a serpent; and Moses fled*
I Kg	*4:30-34*	*And Solomon's wisdom excelled the wisdom of all the children of the east country, and all the wisdom of Egypt. And he spake of trees,....of beasts....., and of creeping things, and of fishes. And there came of all people to hear the wisdom of Solomon, from all kings of the earth, which had heard of his wisdom.*
II Kgs	*18:4*	*He....brake in pieces the brasen serpent that Moses had made: for unto those days the children of Israel did burn incense to it:*
Rom	*1:23,25*	*And changed the glory of the uncorruptible God into an image made like to corruptible man, and to birds, and fourfooted beasts, and creeping things....and worshipped and served the creature more than the Creator,....*
Jas	*3:7*	*For every kind of beasts, and of birds, and of serpents, and of things in the sea, is tamed, and hath been tamed of mankind:*

These passages state that *God* considered reptiles as being good, and entrusted their care to mankind. *God* also states that reptiles may be used for food. Since this time man has displayed a number of varying attitudes toward them. *Moses* expressed fear. *Solomon* gained wisdom by understanding their habits and relationships. Some people worshipped reptiles, and others captured and tamed them. (Author's Note: It seems human behavior towards snakes has changed very little.)

DISCUSSION

According to Klemmer (3), the island of Malta does not at present have any venomous snakes. Malta is generally accepted as the isle of *Melita* (5,9,10) on which the Apostle *Paul* was bitten by a venomous snake (*Acts 28:1-3*). It appears therefore that there were venomous snakes on Malta as recent as A.D. 60 (Unger, page 836), but have since been eliminated from the island. In *Gen 49:17*, the word "*adder*" has in its definition the characteristics of "*snapping*" and "*speckled*". If present-day fauna is representative of *Moses* time this passage may well refer to the Desert Horned Viper (*Cerastes cerastes*) as *Unger* (9) has suggested. It has a somewhat speckled appearance and "*snapping*" is characteristic of its

strike. *Numbers 21:6* reveals venomous snakes in the unusual role as the Lord's direct servants. It is noteworthy that the Bible refers to a *fiery* (C), *flying* (D) serpent in *Isa 30:6*. As one can see from the definitions of the words, it does not necessarily refer to a snake that flys or propels itself through the air. Rather, it is only necessary to conclude that the serpent in this reference elevates, or brandishes, or waves its body above the ground, and is venomous.

Reptiles influenced biblical man's actions and thoughts. Man sometimes worshipped reptiles, and derived a practical education by observing them. Reptilian behavior was often used as a model to which man could compare his own.

It is quite apparent that man's attitude towards reptiles, especially toward snakes, has changed very little over the past few thousand years. Snakes are as feared and revered today as they were in the past. However, recent accent on ecology and the recent generation's awareness of facts concerning wildlife may alleviate this situation in the United States in the years to come.

DICTIONARY

A) *Crooked* - עֲקַלָּתוֹן, *Akallatone:*

DAVIDSON - *Crooked*
STRONG - *Tortous*
Example - *Isa 27:1*

B) *Cruel* - כָּזַר, *Cahzar:*

DAVIDSON - *Cruel, fierce, deadly.*
STRONG - *To act harshly, violent, deadly.*
Example - *Deut 32:33*

C) *Fiery* - שָׂרָף, *Saraph:*

DAVIDSON - *To burn, a species of venomous serpent.*
STRONG - *Burning, poisonous.*
Example - *Num 21:6*

D) *Flying* - עוּף, *Ooph:*

DAVIDSON - *To fly, brandish, a sword.*
STRONG - *To fly*
Example - *Isa 30:6*

E) *Piercing, crooked* - בָּרִחַ, *Bahriach:*

DAVIDSON - *Fleeing, fugitive.*
STRONG - *A fugitive i.e. the serpent (as fleeing)*
Examples - *Job 26:13, Isa 27:1.*

F) *Stingeth* - פָּרַשׁ, *Parrash:*

DAVIDSON - *Sting, wound.*
STRONG - *To separate, to wound.*
Example - *Prov 23:32.*

G) *Swollen* - πιμπρημι, *Pimpreymee:*

BERRY - *To be inflamed, to swell.*
STRONG - *To fire, i.e. burn, become inflamed with fever, swollen.*
Example - *Acts 28:6*

H) *Tamed* - δαμαζω, *Damazo:*

BERRY - *To subdue, tame.*
STRONG - *To tame.*
Example - *Jas 3:7*

I) *Wounded* - חָלַל, *Challal:*

DAVIDSON - *To be pierced, wounded.*
STRONG - *To bore, wound.*
Example - *Isa 51:9*

REFERENCES

1. Berry, George Ricker, *The Interlinear Literal Translation of the Greek New Testament*, Zondervan Publishing House, Grand Rapids, Mich., 1958.

2. Davidson, B., *The Analytical Hebrew and Chaldee Lexicon*, Samuel Bagster & Sons Ltd., London, England, 1966.

3. Klemmer, K., *Classification and Distribution of European, North African, and North and West Asiatic Venomous Snakes*, Venomous Animals and their Venoms, Vol. 1, pp 310, 1968.

4. Leonard, P. M. and Glenn, J. L., *Reptiles in the Bible*, Utah Herp. L. J., Vol. 1, 1, pp 1-8, 1974.

5. Scofield, C. I. Editor, *The Indexed Atlas to the Holy Bible*, The Scofield Reference Bible, Oxford Univ. Press, N. Y. pp 252, copyright 1945.

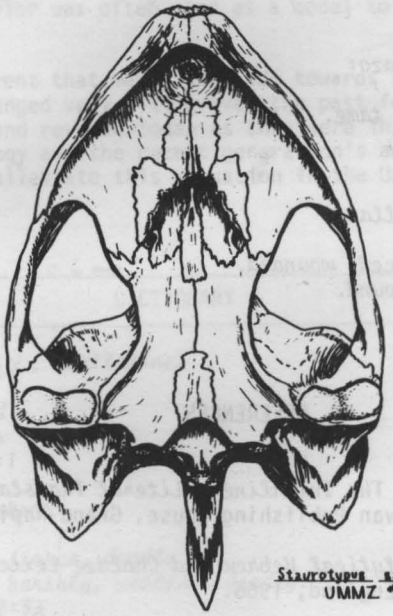
6. Strong, James, *The Exhaustive Concordance of the Bible*, Abingdon Press, New York, N. Y., 1890 (printed 1961).

7. *The Holy Bible*, Authorized King James Version, Oxford University Press, London, England.

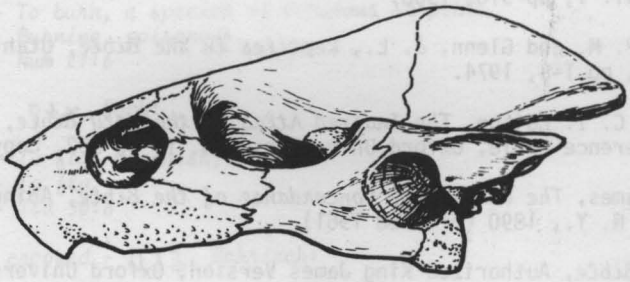
8. *The Holy Scriptures According to the Masoretic Text*, The Jewish Publication Society of America, Phila, Pa., 1969.

9. Unger, Merrill F., *Unger's Bible Dictionary*, Moody Press, Chicago, Ill., 1957.

10. Webster, N., *Websters New Twentieth Century Dictionary of the English Language, Unabridged*, Publishers Guild, N. Y., pp 236 of the appendix, 1943.



Staurotypus salvinii
UMMZ # 245



Staurotypus salvinii
UMMZ # 245

BOOK REVIEWS

HERPETOLOGY - *by Kenneth R. Porter, Dept. of Biol. Sc., University of Denver*

The author has put together a composite of several other familiar books and includes data from many other researchers works including his personal knowledge and research. Written in a style that holds one's interest, it could possibly be the most complete, up-to-date, single volume text about herpetology and should be included in any herpetologist's library, both professional and non-professional alike.

Publisher: W. B. Saunders and Co., West Washington Square, Philadelphia, Pa. 19105 Price $15.00 J. G.

PRINCIPLES OF SYSTEMATIC ZOOLOGY - *by Ernst Mayr 428 pages - 1969*

A "must" book for any "herp" interested in Taxonomy and Systematics. Presents the reader with a thorough understanding of the principles, methods and application of zoological nomenclature and classification. A most authoritative work by one renown for his work in this field.

Publisher: McGraw-Hill Book Company, San Francisco - St. Louis - New York Price $13.00 J. G.

BIOMECHANICS, AN APPROACH TO VERTEBRATE BIOLOGY - *by Carl Gans 261 pages - 1974*

A book intended by its author to supplement textbooks in courses concerning comparative anatomy and vertebrate biology. Fully illustrated and discussed are such subject matters as egg eating in snakes, locomotion without limbs, burrowing mechanics in *Amphisbaenians*, air breathing and vocalization in frogs and structure and function of various morphology. Written in a very readable style and can serve as a guide for anyone interested in pursuing interests in biomechanics.

Publisher: J. B. Lippincott Company, Philadelphia - Toronto

J. G.

BOOK ON KANSAS HERPTILES - *283 pages - 1974*

This book was written by *Joseph T. Collins*, Kansas Museum of Natural History and is entitled "Amphibians and Reptiles in Kansas". The book

includes Natural History accounts of 91 herptiles, with detailed maps, over 100 photographs and the status of threatened species in Kansas. Published in August 1974, it can be purchased from:

Publications Secretary
Museum of Natural History
University of Kansas
Lawrence, Kansas 66045 Price $5.00

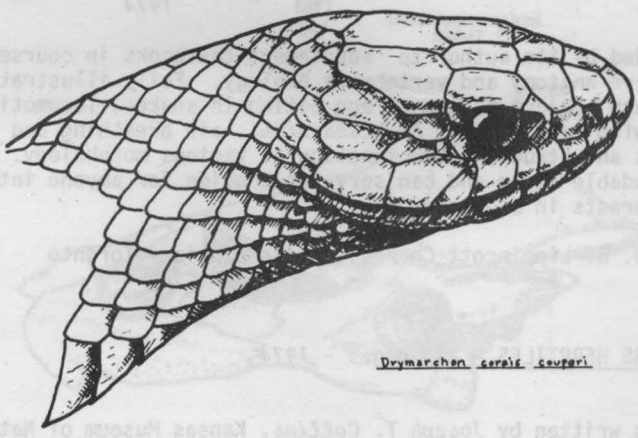
J. G.

THE GREAT SALT LAKE BIOTIC SYSTEM - *by E. V. Rawley, B. C. Johnson, D. M. Rees 431 pages*

A comprehensive look at the biology and ecology of the immediate vicinity of the Great Salt Lake. The survey of this salinated region covers the animal life present including bacteria, invertebrates, noxious insects, fishes, amphibians, reptiles, birds and mammals. Plant life and some geology is also presented. An immense amount of information is presented and will enhance the library of any herpetologist.

Publication #74-13, Utah Dept. of Nat. Res., Div. of Wildlife Res., Salt Lake City, Utah Price $3.00 (includes shipping)

J. G.



K.S. MATZ-

AMPHIBIAN AND REPTILIAN REPRODUCTION

This section is for publishing courtship, breeding and/or birth data. All data submitted is published un-edited and includes information such as: field notes, gestation periods, incubation times, animal size, sex ratios, courtship behavior, ontogenetic changes..etc.... Short comments by the author may be included.

REPTILIAN REPRODUCTION NOTES

Crotalidae Reproduction Data

JAMES L. GLENN, RICHARD C. STRAIGHT AND CLIFFORD C. SNYDER

All snake data obtained day of birth, unless otherwise noted. Sexes determined by manual extrusion of hemipenes in males or lack of hemipenes in females; SN-V = snout-vent)

Crotalus adamanteus (E. Diamondback Rattlesnake)

So. Florida, 53 inches, wild bred - #CA21
Birth = 9/20/72, 5 males (1 dead) + 6 females (Dead male excluded from data)

	Range	Mean	Vari-ance	Std. Dev.	Std. Error of mean	Sum of X	# Specimens
Combined sexes							
Total length (inches)	14.75-16.5	15.8	0.23	0.48	0.15	157.75	10
Weight (grams)	46.5-71.5	62.3	-	-	-	623	10
Males							
Total length (inches)	14.75-16.0	15.5	0.29	0.54	0.27	62.0	4
Weight (grams)	46.5-71.5	59.6	-	-	-	238.5	4
Females							
Total length (inches)	15.5-16.5	16.0	0.14	0.37	0.15	95.75	6
Weight (grams)	61.5-66.5	64.1	-	-	-	384.5	6

Crotalus adamanteus (E. Diamondback Rattlesnake)

So. Florida, 53 inches, wild bred - #CA41
Birth = 10/23/73 (8 pm - 7 am), 0 males + 12 females

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
All females						
Total length (inches)	15.5-16.75	16.2	0.18	0.43	0.12	12
Weight (grams)	51-77	69.3	-	-	-	12
Tail Bands (dark)	4-7	5.7	0.97	0.98	0.28	12

Crotalus atrox (W. Diamondback Rattlesnake)

Oklahoma, 1970, wild bred, length = 46 inches - #CAA8
Birth = 9/2/70, 5 males

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
All males						
Total length (inches)	11.5-11.75	11.60	0.02	0.14	0.06	5
Weight (grams)	18-21.3	19.24	1.56	1.25	0.56	5
Dark Tail rings	5-6	5.50	0.25	0.50	0.22	5

Crotalus atrox (W. Diamondback Rattlesnake)
Oklahoma 4/22/70, wild bred, length = 48 inches - #CAA6
Birth = 8/29/70, 11 males + 0 females

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
All males						
Length (inches)	11.7-12.1	11.85	0.08	0.29	0.09	11
Weight (grams)	15-18.3	17.25	0.79	0.89	0.27	11
Dark Tail rings	5-7	5.86	0.46	0.67	0.20	11

Crotalus atrox (w. Diamondback Rattlesnake)
from Oklahoma, 4/17/75, wild bred - #CAA12
Birth = 9/6/74, 7 males + 5 females (5 dead)
(weights and measurements ~ 24 hours following birth)

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
Combined sexes						
Sn-v length (inches)	9.25-10.25	9.99	0.15	0.39	0.15	7
Tail length (inches)	.70-.90	.81	0.005	0.07	0.03	7
Weight (grams)	18.9-21.9	20.60	1.11	1.06	0.40	7
Males						
Sn-v length (inches)	9.25-10.25	9.98	0.26	0.51	0.26	4
Tail length (inches)	.75-.90	0.83	0.004	0.07	0.03	4
Weight (grams)	18.9-21.3	20.35	1.28	1.13	0.57	4
Dark Tail rings	3.5-4.5	4.25	0.25	0.50	0.25	4
Females						
Sn-v Length (inches)	9.7-10.25	10.0	0.06	0.25	0.14	3
Tail Length (inches)	.70-.85	.78	0.006	.08	0.04	3
Weight (grams)	19.8-21.9	20.9	1.12	1.06	0.61	3
Dark Tail rings	2.5-3.5	3.17	0.33	0.58	0.33	3

Crotalus atrox (w. Diamondback Rattlesnake)
Texas, wild bred, length = 44 inches
Birth = 9/25/72, 2 males + 3 females

	Length (inches)	Weight (grams)
Male	11.75	31.5
Male	12.0	30.0
Female	11.25	31.0
Female	11.5	30.0
Female	11.5	27.0

Crotalus viridis lutosus (Great Basin Rattlesnake)
Wild bred, rc'd 5/8/74 from N. W. Arizona - CVL #33
Parent female = 38 inches
Birth = 9/4/74 (early am) 5 males + 4 females

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
Combined sexes						
Sn-vent length (inches)	8.25-9.0	8.61	0.047	0.216	0.072	9
Tail length (inches)	.5-.85	.69	0.012	0.111	0.037	9
Total length (inches)	8.75-9.85	9.3	0.099	0.315	0.105	9
Dorsal Blotches to vent	36-42	38.8	2.69	1.64	0.55	9
Tail Bands (drk)	5-9	6.56	2.215	1.49	0.496	9
Weight (grams)	11.1-12.1	11.6	0.139	0.372	0.124	9
Males (M)						
Sn-vent length (inches)	8.5-9.0	8.71	0.04	0.19	0.08	5
Tail length (inches)	.70-.85	0.77	0.003	0.06	0.03	5
Total length (inches)	9.25-9.85	9.48	0.06	0.24	0.11	5
Dorsal Blotch to vent	36-42	39.0	5.0	2.24	1.0	5
Tail Bands (dark)	7-9	7.7	0.70	0.84	0.37	5
Weight (gms)	11.1-12.1	11.52	0.14	0.38	0.17	5
Females (F)						
Sn-vent length (inches)	8.25-8.70	8.49	0.04	0.20	0.10	4
Tail length (inches)	.5-.65	0.59	0.004	0.06	0.03	4
Total length (inches)	8.75-9.35	9.08	0.07	0.26	0.13	4
Dorsal Blotch to vent	38-39	38.5	0.33	0.58	0.29	4
Tail Bands (dark)	5-5.5	5.13	0.06	0.25	0.13	4
Weight (gms)	11.1-12.0	11.68	0.16	0.40	0.20	4

Crotalus viridis lutosus (Great Basin Rattlesnake)
Parent Female Length = 31 inchies, weight following births = 261 gms
Wild bred, from Magna, Utah - CVL #47
Birth = 9/1/73 (am) 4 males + 7 females
(weights and measurements within 12 hours of birth)

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
Combined sexes						
Length (inches)	9.1-10.0	9.66	0.09	.30	0.09	11
Weight (grams)	10-14.7	13.29	2.60	1.61	0.49	11
Males						
Length (inches)	9.1 - 10.0	9.73	0.18	0.43	0.21	4
Weight (grams)	11-14.7	12.88	2.87	1.69	0.85	4
Dark Tail Bands	5-7	6.0	1.33	1.16	0.58	4
Females						
Length (inches)	9.1-9.8	9.62	0.06	0.24	0.09	7
Weight (grams)	10-14.7	13.53	2.72	1.65	0.62	7
Dark Tail Bands	3-4	3.71	0.24	0.49	0.18	7

Crotalus viridis lutosus (Great Basin Rattlesnake)
Length = 41 inches
Wild bred, from Magna, Utah - CVL #48
Birth = 9/11/73 (8-11 am) 4 males + 5 females (2 dead)
(weights and measurements 2-4 hours following birth)

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
Combined sexes						
Length (inches)	10.25-11.5	10.60	0.20	0.44	0.17	7
Weight (grams)	15.7-20.0	17.9	1.82	1.35	0.51	7
Males						
Length (inches)	10.25-11.5	10.69	0.31	0.55	0.28	4
Weight (grams)	17.5-20	18.65	1.19	1.09	0.55	4
Dark Tail Bands	5-7	5.75	0.92	0.48	23.0	4

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
Females						
Length (inches)	10.25-10.75	10.43	0.08	0.28	0.16	3
Weight (grams)	15.7-17.9	17.0	1.33	1.15	0.67	3
Dark Tail Bands	4	4	0	0	0	3

Venom Research Laboratory
V. A. Hospital
Salt Lake City, Utah 84113

Colubridae Reproduction Data

MICHAEL P. COFFEEN

Elaphe obsoleta obsoleta (Black Rat Snake)
Wild bred, 7 eggs laid 6/21/74, 7 eggs hatched 8/20/74
(weights and measurements 24 hours after birth)

	#1	2	3	4	5	6	7
Sex	F	F	F	M	M	M	M
Total Length (inches)	15.5	16.0	16.0	15.5	15.0	16.0	16.5
Weight (grams)	17.1	17.5	17.5	17.1	16.6	16.2	17.7

Ahaetulla ahaetulla SSP. (Bronzeback Snake)
Female parent from Bangkok Thailand
4 eggs laid 4/22/73 2-6 pm
3 eggs hatched 7/9/73

	Total length (inches)	Weight (grams)
male =	9.5	1.19
female =	9.0	1.09
female =	9.0	1.05

Natrix e. erythrogaster (Plain-bellied Water Snake)
Birth = 6/21/74, 6 males + 7 females

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
Combined Sexes						
Length (inches)	8.3-8.8	8.5	0.03	0.2	0.051	13
Weight (grams)	2.2-2.9	2.5	0.05	0.2	0.062	13
Males						
Length (inches)	8.3-8.7	8.5	0.03	0.2	0.071	6
Weight (grams)	2.2-2.8	2.6	0.04	0.2	0.084	6
Females						
Length (inches)	8.3-8.8	8.5	0.04	0.2	0.075	7
Weight (grams)	2.2-2.9	2.5	0.06	0.3	0.095	7

Pituophis melanoleucus deserticola (Gopher Snake)
Zoo bred, 7 eggs laid 7/11/74, Hatched 9/5/74 (2 infertile)

	#1	2	3	4	5
Sex	F	F	F	M	M
Total length (inches)	15.5	15.5	15.5	16.0	16.0
Weight (grams)	21	20.25	21	21	20.75
Dorsal Markings to Vent	56	56	53	55	58
Dark Tail rings	13	16	14	14	17

Note: Snakes hatched in quart jar loosely filled with peat moss - 2 snakes returned to egg shell to hide following hatching.

Pituophis melanoleucus deserticola (Gopher Snake)
Zoo bred, eggs laid 7/9/74
Birth = eggs hatched 8/31/74, 5 female + 1 male

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
Combined Sexes						
Length (inches)	12.5-14	13.58	0.34	0.58	0.24	6
Weight (grams)	12-15.5	14.35	1.74	1.32	0.54	6
Dorsal Blot to Vent	55-58	57.17	1.37	1.17	0.48	6
Tail Bands (Dark)	15-19	16.33	2.27	1.51	0.61	6

Sroreria dekayi (Dekays snake)
Wild bred, 10 inches (250 mm), 5.2 grams following birth
Birth = 7/23/73, 12 young (sex?) (3 dead)

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
Combined Sexes						
Total length (inches)	3.7-4.0	3.8	0.02	0.13	0.04	9
Weight (grams)	0.25-0.30	0.28	0.00	0.02	0.01	9

Hogle Zoological Gardens

KENT FARNSWORTH

Thamnophis elegans vagrans (Western Garter Snake)
Birth = 9/7/73, 5 males + 7 females

	Range	Mean	Variance	Std. Dev.	Std. Error of Mean	# Specimens
Combined Sexes						
Length (inches)	8.25-9.0	8.6	0.1	0.2	0.072	12
Weight (grams)	3.1-3.4	3.3	0.01	0.1	0.027	12
Males						
Length (inches)	8.5-9.0	8.8	0.1	0.3	0.112	5
Weight (grams)	3.1-3.4	3.2	0.01	0.1	0.049	5
Females						
Length (inches)	8.25-8.75	8.5	0.04	0.2	0.077	7
Weight (grams)	3.2-3.4	3.3	0.01	0.1	0.027	7

Hogle Zoological Gardens
Salt Lake City, Utah 84110

Bell's HERPETOLOGY OF THE "BEAGLE"

EDITED BY CHARLES DARWIN

with a new Preface by ROBERTO DONOSO-BARROS *(Chile)*

About 100 pages, 20 plates, 8 1/2 by 11 inches, originally published in London, 1843

The round-the-world voyage of the H.M.S. *Beagle* (1832-36) under the command of Captain FitzRoy, was to have a profound effect on the science of biology. Young Charles Darwin, naturalist to the expedition, not only collected the specimens, but also edited and superintended the classic work *The Zoology of the Voyage of the H.M.S. Beagle*, written by various authors. The British naturalist Thomas Bell was responsible for Part V, dealing with amphibians and reptiles.

This classic monograph, long out of print, contains detailed descriptions of 46 species (including six new genera and 25 new species) of amphibians and reptiles. Most of the material was collected in South America, but species are described from Africa, Australia, Tasmania, New Zealand and Mauritius. Nearly all species are beautifully illustrated in 20 finely engraved plates.

prices

SSAR members *before publication*: $4 paper, $8 cloth
Institutions and Non-members: $9 paper, $13 cloth

to order

Orders may be placed now. This book will be published in Fall 1975; to take advantage of special prices, *SSAR* members must place their orders *before publication*.

Please circle edition desired and send with payment to Dr. Henri C. Seibert, Morton Hall, Ohio University, Athens, Ohio, USA 45701. Make checks payable to "SSAR." Receipt sent on request only. Mark these boxes if you want information on *SSAR* membership ☐ or a complete list of Society publications ☐.

ZOO BOOK Service
Division of RALPH CURTIS BOOKS

2633 Adams St.,
Hollywood, Florida 33020
Tel. (305) 925-4639

NOW!
LOOK WHAT'S NEW. . .

A BRAND NEW REVISED CLASSIC
REPTILE BOOK. . . . . .

A GUIDE TO
THE SNAKES OF UGANDA

BY

CHARLES R. S. PITMAN

REVISED EDITION

312 pp. with 29 coloured plates, 22 plain plates and 2 maps, crown 4to, cloth bound.

Price $29.00

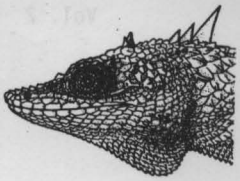
The first edition of this book was published in Uganda in 1938 and consisted of only 450 copies. It has long been rare, and in recent years the few copies that have turned up have been selling for about £60.00.

The author has now completely revised the text and 5 new coloured plates have been added, so that the new edition of this standard work is completely up to date. As the only comprehensive work on the snakes of any part of Africa north of the Zambesi it has an importance far beyond the confines of Uganda.

Distributed by:
RALPH CURTIS BOOKS
2633 Adams Street
Hollywood, Fla. 33020

OUR COMPLETE PRICE LIST OF ZOOLOGICAL BOOKS AVAILABLE ON REQUEST.

RALPH CURTIS BOOKS



2633 Adams St. Hollywood, Fla. 33020

THE REPRINT EDITION OF

FAUNA OF BRITISH INDIA - REPTILIA AND AMPHIBIA

VOL. 1 LORICATA, TESTUDINES & VOL. 2 SAURIA

THE TWO VOLUMES COVER THE LIZARDS, TURTLES, TORTOISES AND CROCODILES OF THE AREA OF SOUTHERN ASIA NOW COMPRISING: INDIA, WEST PAKISTAN, BURMA, THAILAND, CAMBODIA, LAOS, NORTH & SOUTH VIET-NAM, BANGLADESH, ASSAM, NEPAL, HONG KONG, TAIWAN, CEYLON, AND EXTREME SOUTH-EAST CHINA.

\- - -

A TWO VOLUME, QUALITY REPRINT, OF A CLASSIC WORK, LONG OUT-OF-PRINT AND SCARCE. BOUND IN MAROON CLOTH, GOLD STAMPED. EACH VOLUME CONTAINS KEYS, DESCRIPTIONS, RANGES AND HABITS ON EACH SPECIES. A GLOSSARY OF TECHNICAL TERMS, BIBLIOGRAPHIES, SEPARATE ALPHABETICAL AND SYSTEMATIC INDEXES, AND MAPS OF THE AREA ARE INCLUDED IN EACH VOLUME. EXCELLENT, DETAILED LINE ILLUSTRATIONS AND THREE PAGES OF PLATES ARE FAITHFULLY REPRODUCED.

\- - -

VOL. 1 FAUNA OF BRITISH INDIA - REPTILIA and AMPHIBIA - Loricata Testudines, By Malcolm A. Smith (1931) (Reprinted 1973)
P.p. i-xxvii, 1-185, 2 plates, map, 42 text figs.
I.S.B.N. 0-88359-005-0

Covers the crocodiles, turtles and tortoises of Southern Asia from what is now West Pakistan to Viet-nam, on to Hong Kong and including Ceylon and Taiwan. Total of 217 pages with 55 illus. Contains 2 pages of plates of turtle heads, line drawings, keys for identification, accounts of habits, glossary of technical terms, index and description of the geographical areas. This volume also contains an eleven page history of the herpetological research in the Indian-Indo-China areas, with biographical sketches of 33 of the earlier researchers. Vol. 1 *(purchased separately)*.....$15.00s

VOL. 2 FAUNA OF BRITISH INDIA - REPTILIA and AMPHIBIA - Sauria
By Malcolm S. Smith (1935) (Reprinted 1973)
P.p. i-ix, 1-440, 2 maps, 1 plate, 94 text figures.

Covers the lizards of the Southern Asia area as Vol. 1. Total of 455 pages with 107 illustrations, including 1 page of plates. Contains keys for identification, accounts of habits, descriptions, ranges, glossary, index, map of the area, and bibliography.
Vol. 2 *(purchased separately)*.....$22.50s

PRICE FOR THE SET - VOLS. 1 & 2.....$35.00s

NOTICE TO INSTITUTIONS

FREE SUBSCRIPTION TO THIS JOURNAL

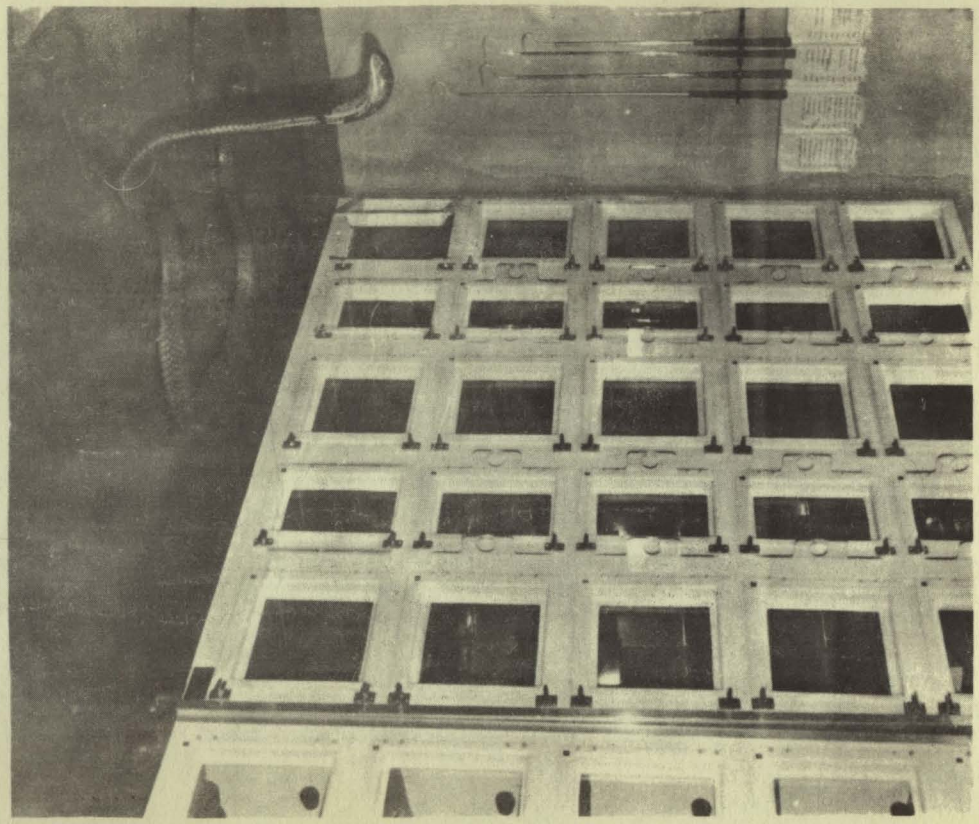
One goal of our league is to distribute the information published in this Journal to all zoological gardens in the United States that have reptile collections (at no cost). If you would like to be placed on our mailing list just send a request with your zoo's name and address to:

Mike Coffeen, Secretary
Utah Herpetologists League
Hogle Zoological Gardens
P. O. Box 2337
Salt Lake City, Utah 84110

By distributing this Journal to the nation's major zoological herp collections, we feel the information will be distributed where it will do the most good. If you would like to contribute to the cost of this publication, please do so, however it is not a prerequisite for receiving it or for publishing articles in it. Zoos are asked to submit articles of herpetological interest for publication, i.e., courtship and breeding behavior, birth data, caging, feeding, diseases (case histories), etc...See back page of Journal for format.

This Journal is financed by the League membership dues ($5.00/yr), and contributions from Hogle Zoological Gardens and Ventox Corporation, Salt Lake City, Utah. Contributions by other institutions will be listed in future Journals as they occur.

THE UTAH HERPETOLOGISTS LEAGUE JOURNAL publishes articles that deal with reptiles and amphibians and the institutions and individuals that deal with them. All manuscripts submitted are reviewed by one of our staff. Any manuscript that is edited to any degree is returned to the author before publication.

FORMAT - Submit manuscripts in duplicate, typewritten double-spaced on white bond paper. Scientific names should be underlined. Titles should be as brief as possible and tables and illustrations should be of good reproducible quality. Photographs should be black and white, 2 x 3 inches to 3 x 5 inches in size, preferably a print or negative. Legends should be included with numbers corresponding to the proper photographs. Photographs are not returnable. Mail to:

Utah Herpetologists League
Hogle Zoological Gardens
P. O. Box 2337
Salt Lake City, Utah 84110